

WHAT IS CLAIMED IS:

- 1        1. A system useful for dispensing medication comprising :
  - 2              a foundation;
  - 3              a gripper including a first portion and a second portion spaced from the
  - 4              first portion, the first portion being movable toward and away from the second portion
  - 5              along a gripper direction;
  - 6              a first actuator which changes length in response to a stimulus, the first
  - 7              actuator partially secured to the foundation and positioned adjacent to the gripper first
  - 8              portion, the first actuator oriented relative to the gripper direction and positioned
  - 9              relative to the gripper first portion so that when the first actuator changes length in
  - 10          response to a stimulus the first actuator moves the gripper first portion along the
  - 11          gripper direction;
  - 12          a second actuator which changes length in response to a stimulus, the
  - 13          second actuator partially secured to the foundation and positioned adjacent to one of
  - 14          the gripper portions, the second actuator oriented relative to the gripper direction and
  - 15          positioned relative to said one of the gripper portions so that when the second actuator
  - 16          changes length in response to a stimulus the second actuator moves said one of the
  - 17          gripper portions along a direction different from the gripper direction.
- 1        2. A system in accordance with Claim 1, wherein at least one of the first
- 2        actuator and the second actuator comprise piezoelectric actuators.

1           3. A system in accordance with Claim 1, wherein the first actuator and the  
2 second actuator comprise piezoelectric actuators.

1           4. A system in accordance with Claim 1, further comprising:  
2                 a third actuator which changes length in response to a stimulus, the third  
3 actuator partially secured to the foundation and positioned adjacent to another of the  
4 gripper portions, the third actuator oriented relative to the gripper direction and  
5 positioned relative to said another of the gripper portions so that when the third  
6 actuator changes length in response to a stimulus the third actuator moves said  
7 another of the gripper portions along a direction different from the gripper direction.

1           5. A system in accordance with Claim 1, further comprising:  
2                 a medication cartridge releasably mounted to the foundation, the  
3 medication cartridge including a hollow barrel, and open end, and an outlet opposite  
4 the open end;  
5                 a plunger slidably positioned in the barrel;  
6                 a piston slidably positioned in the barrel adjacent to the plunger, the piston  
7 including portions extending between the gripper first portion and the gripper second  
8 portion;  
9                 the piston and the gripper first portion sized, positioned, and configured so  
10 that when the gripper first portion moves along the gripper direction toward the  
11 gripper second portion, the gripper first portion engages the piston.

1       6. A system in accordance with Claim 1, further comprising:  
2              a medication bag releasably mounted to the foundation, the medication  
3              bag including a first sidewall and an outlet;  
4              a piston slidably mounted to the foundation, the piston including portions  
5              extending between the gripper first portion and the gripper second portion;  
6              a roller attached to the piston and positioned immediately adjacent to the  
7              medication bag sidewall;  
8              the piston and the gripper first portion sized, positioned, and configured so  
9              that when the gripper first portion moves along the gripper direction toward the  
10             gripper second portion, the gripper first portion engages the piston.

1       7. A system useful for dispensing medication comprising:  
2              a medication cartridge including a hollow barrel, and open end, and an  
3              outlet opposite the open end;  
4              a plunger slidably positioned in the barrel;  
5              a slide positioned in the barrel adjacent to the plunger and movable in the  
6              barrel along a slide direction;  
7              a first actuator which changes length in response to a stimulus, the first  
8              actuator partially secured to the slide, the first actuator oriented relative to the slide  
9              direction and so that when the first actuator changes length in response to a stimulus  
10             the first actuator moves the slide along the slide direction;

11           a second actuator which changes length in response to a stimulus, the  
12   second actuator partially secured to the slide, the second actuator oriented relative to  
13   the slide direction so that when the second actuator changes length in response to a  
14   stimulus the second actuator engages the barrel inside surface and holds the slide in  
15   the barrel.

1           8. A system in accordance with Claim 7, wherein the slide includes a slide  
2   first portion to which the first actuator and the second actuator are partially attached,  
3   and the slide including a slide second portion movable relative to the slide first  
4   portion along the slide direction, and further comprising:

5           a third actuator which changes length in response to a stimulus, the third  
6   actuator partially secured to the slide second portion, the third actuator oriented  
7   relative to the slide direction so that when the third actuator changes length in  
8   response to a stimulus the third actuator engages the barrel inside surface and holds  
9   the slide second portion in the barrel.

1           9. A system useful for dispensing medication comprising:  
2           a U-shaped flexible shaft;  
3           a solenoid movable between first and second positions;  
4           a pawl connected to the solenoid;  
5           a pinion having teeth and positioned with the pawl between the pinion  
6   teeth;

7           a belt on the pinion;  
8           an arm attached to the belt and to the flexible shaft;  
9           wherein movement of the solenoid between the first and second positions  
10       moves the pawl, the pawl rotating the pinion, the pinion moving the belt, the belt  
11       moving the arm, the arm moving the flexible shaft.

1           10.   A system in accordance with Claim 9, further comprising:  
2           a medication cartridge including a hollow barrel, and open end, and an  
3       outlet opposite the open end;  
4           a plunger in the cartridge barrel;  
5           the flexible shaft extending into the cartridge barrel and engaging the  
6       plunger.

1           11.   A device useful for dispensing a liquid comprising:  
2           a plurality of needles, the needles each including a sharpened end and  
3       being bent adjacent to the sharpened end;  
4           a base including bores in which the needles are at least partially  
5       inserted, the base including an annular space to which the bores extend;  
6           a cap sealingly mounted to the base and forming a plenum space with  
7       the base, the plenum space including a portion of the base annular space, the cap  
8       including a fluid passageway in fluid communication with the plenum space.

1           12. A device in accordance with Claim 11, further comprising:  
2                         an annular member having a center hole, the base positioned in the  
3                     center hole.

1           13. A device in accordance with Claim 12, further comprising:  
2                         a ring positioned against the needle bends, the needles positioned  
3                     between the ring and the annular member, the needle sharpened ends extending past  
4                     the ring.

1           14. A device in accordance with Claim 13, wherein the needle sharpened  
2             ends extend past the ring a distance between about 0.5 mm and about 3.0 mm.

1           15. A device in accordance with Claim 11, wherein the needle sharpened  
2             ends are bent between at and angle between about 1 degree and about 25 degrees.